

nonshrinkable fibre web.

USE - For making interior sheets and panels or cars. (6pp Dwg.No 0/0)

Derwent Class: A96; F04; P73

International Patent Class (Additional): B32B-005/26; D04H-001/48

8/7/3

DIALOG(R) File 352: Derwent WPI

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007771065

WPI Acc No: 1989-036177/198905

Crepe-like nonwoven fabric with good shape stability - comprises treating intertwined thermally shrinkable and non-shrinkable fibres with high pressure fluid

Patent Assignee: SHINWA KK (SHIN-N)

Number of Countries: 001 Number of Patents: 002

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 63309657	A	19881216	JP 87140531	A	19870604	198905 B
JP 2670673	B2	19971029	JP 87140531	A	19870604	199748

Priority Applications (No Type Date): JP 87140531 A 19870604

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 63309657	A		14		
JP 2670673	B2		3	D04H-001/46	Previous Publ. patent JP 63309657

Abstract (Basic): JP 63309657 A

The crepe-like nonwoven fabric with good form stability is a binder-free nonwoven fabric composed of (a) 5-90 wt.% of thermally shrinkable fibre and (b) 10-95 wt.% of non-shrinkable fibre. The shrinkable fibre (a) and the non-shrinkable fibre (b) are closely intertwined together by treating with a columnar flow of high pressure fluid; and many random ribs are formed on the nonwoven fabric surface by heat treatment to cause shrinkage of the fibre (a) and consequential bending of the fibre (b).

USE/ADVANTAGE - The nonwoven fabric is applicable to towel- and underwear use. By the high-pressure fluid treatment of blended nonwoven fabric, improved strength and form stability are obtained without affecting the softness and flexibility.

0/0

Derwent Class: A11; A23; A94; F04

International Patent Class (Main): D04H-001/46

International Patent Class (Additional): D04H-001/42; D04H-001/48

8/7/4

DIALOG(R) File 352: Derwent WPI

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007755301

WPI Acc No: 1989-020413/198903

Textured press- or vacuum-formed sheet - comprises skin with emboss textured pattern and nonwoven polyester sheet

Patent Assignee: ASAHI CHEM IND CO LTD (ASAHI)

Number of Countries: 001 Number of Patents: 002

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week
JP 63296936	A	19881206	JP 87131291	A	19870529	198903 B
JP 2592452	B2	19970319	JP 87131291	A	19870529	199716

Priority Applications (No Type Date): JP 87131291 A 19870529

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 63296936	A		9		

JP 63309657A

1. Title of the Invention

Crepe-like Nonwoven Fabric with Excellent Form Stability

2. Claims

A crepe-like nonwoven fabric with excellent form stability which is a binder-free nonwoven fabric comprising 5 to 90% by weight of thermally shrinkable fiber and 10 to 95% by weight of non-shrinkable fiber, characterized in that the thermally shrinkable fiber and the non-shrinkable fiber are closely intermingled with each other by a high-pressure columnar flow of fluid, and the thermally shrinkable fiber has shrunken to distort the non-shrinkable fiber to form a large number of random ribs on the surface of the nonwoven fabric.

3. Detailed Description of the Invention

[Industrial Field of Application]

This invention relates to a crepe-like nonwoven fabric which is free of a binder and excellent in form stability and hand. More particularly, it relates to a crepe-like nonwoven fabric suitable for use as a towel, underwear, etc.

[Prior Art and Problems that the Invention is to Solve]

Nonwoven fabric, obtained from fiber without spinning nor knitting or weaving unlike knitted or woven fabric, can be produced at lower cost and has been used in various applications. Nevertheless it is unsuited for applications to clothes or cloth-made personal articles because of its inferiority in hand

to woven fabric, etc.

Attempts have been made to form a large number of ribs on the surface of nonwoven fabric to provide crepe-like nonwoven fabric with improved hand. Such crepe-like nonwoven fabric has been produced as follows. A web made of a mixture of thermally shrinkable fiber and non-shrinkable fiber is provided with a binder solution. The binder solution is half dried to temporarily bind the fibers constituting the web. The thermally shrinkable fiber is then caused to shrink. It follows that the non-shrinkable fiber is distorted to form a great number of ribs on the surface of the web. Thereafter, the binder solution is dried completely to give a crepe-like nonwoven fabric.

Because the binder is solidified all over the binder-containing crepe-like nonwoven fabric, the fabric is still insufficient in flexibility and hard to the touch. Sufficient improvement in hand has not yet been achieved. Because binding of constituent fibers relies on the binder, the nonwoven fabric has poor strength. Therefore, this kind of nonwoven fabric has limited applications, such as disposable hand wipes. It is unusable as clothes or cloth-made personal articles such as towels.

To overcome the problem, the present inventors have conducted extensive investigations and succeeded in obtaining a strong, crepe-like nonwoven fabric without using a binder.

The present invention has been completed based on this success.  
[Means for Solving the Problems and Effect]

The present invention relates to a crepe-like nonwoven fabric with excellent form stability which is a binder-free nonwoven fabric comprising 5 to 90% by weight of thermally shrinkable fiber and 10 to 95% by weight of non-shrinkable fiber, characterized in that the thermally shrinkable fiber and the non-shrinkable fiber are closely intermingled with each other by a high-pressure columnar flow of fluid, and the thermally shrinkable fiber has shrunken to distort the non-shrinkable fiber to form a large number of random ribs on the surface of the nonwoven sheet.

The thermally shrinkable fiber which can be used in the invention is fiber that shrinks (the term "to shrink" is intended to include "to self-crimp") upon being heated. Such shrinkable fiber is prepared by, for example, highly drawing fiber in spinning. Also useful is side-by-side conjugate fiber prepared by melt spinning two components having different shrinkage percentages from the respective spinning nozzles and joining the spun components side by side. On being heated, only one of the components making the conjugate fiber shrinks to develop a crimp.

The non-shrinkable fiber which can be used in the invention is fiber that does not shrink at a temperature at which the thermally shrinkable fiber starts shrinking.

The crepe-like nonwoven fabric of the invention comprises 5 to 90% by weight of the thermally shrinkable fiber and 10 to 95% by weight of the non-shrinkable fiber. If the thermally shrinkable fiber content is less than 5% by weight, the overall shrinkage is insufficient for sufficiently distorting the non-shrinkable fiber. If it is more than 90% by weight, the relative proportion of the non-shrinkable fiber is too small, and the attendant distortion of the non-shrinkable fiber is too small, making it difficult to form ribs on the surface of the nonwoven fabric.

The thermally shrinkable fiber and the non-shrinkable fiber are mutually and closely intermingled by a high-pressure columnar flow of fluid. The high-pressure columnar flow of fluid is a stream of incompressible fluid jetted through a small-diametered nozzle orifice under high pressure. Specifically, it is a water jet spouted through an orifice of about 0.001 to 0.1 cm in diameter under a pressure of 5 to 400 kg/cm<sup>2</sup>. Such a high-pressure columnar fluid flow jetted against the fiber web moves the constituent fibers and mutually and closely intermingles neighboring fibers. As a result, high strength nonwoven fabric can be obtained without using a binder.

The crepe-like nonwoven fabric of the invention has on its surface a numerous random ribs formed by distorting the non-shrinkable fiber. The distortion of the non-shrinkable fiber is caused by shrinkage of the thermally shrinkable fiber

after the thermally shrinkable fiber and the non-shrinkable fiber are closely intermingled by applying a high-pressure columnar flow of fluid to the fiber web. That is, the distance between arbitrary two points of a non-shrinkable fiber entangled with a thermally shrinkable fiber gets shorter on shrinkage of the thermally shrinkable fiber, and the part of the non-shrinkable fiber between entanglement joints is distorted as a result.

The crepe-like nonwoven fabric of the invention is obtained by the following process. A mixture of thermally shrinkable fiber and non-shrinkable fiber is fabricated into a fiber web by carding, air-laying, and the like. A high-pressure columnar fluid flow is jetted against the entire area of the web to prepare fleece in which constituent fibers are closely intermingled. Heat is applied to the fleece to cause the thermally shrinkable fiber to shrink thereby to obtain a crepe-like nonwoven fabric of the present invention.

[Example]

#### EXAMPLE 1

A mixture of 30 wt% of thermally shrinkable polyester fiber having a fiber length of 64 mm and a fineness of 3 denier and 70 wt% of non-shrinkable rayon fiber having a fiber length of 64 mm and a fineness of 1.5 denier was carded into a web having a basis weight of 50 g/m<sup>2</sup>.

The web was placed on a flat plate. Water was uniformly

jettted to the web through a nozzle having an orifice diameter of 0.02 cm under a pressure of 50 kg/cm<sup>2</sup>. The distance between the nozzle tip and the web was 10 cm. The resulting fleece was an aggregate of closely intermingled fibers.

Steam of 90°C was applied all over the fleece to cause the polyester fiber to shrink. The fleece was then dried in a drier at 100°C to obtain a crepe-like nonwoven fabric having a basis weight of 50 g/cm<sup>2</sup>. The resulting nonwoven fabric had a great number of ribs randomly formed on its surface. It had an MD strength of 5.4 kg/5 cm-width, a TD strength of 16 kg/5 cm-width, an MD elongation of 96%, and a TD elongation of 48%. It was satisfactory in hand in terms of flexibility and feel.

#### EXAMPLE 2

Side-by-side conjugate fiber (thermally shrinkable fiber) composed of nylon 6 and nylon 66 and having a fiber length of 72 mm and a fineness of 1.6 denier was carded into a first web having a basis weight of 25 g/cm<sup>2</sup>. Rayon fiber having a fiber length of 64 mm and a fineness of 1.5 denier was carded into a second web having a basis weight of 25 g/m<sup>2</sup>. The first and the second webs were superposed on each other, placed on a flat plate, and treated with water jets in the same manner as in Example 1. As a result, there was obtained fleece, in which the conjugate fibers in the first web and the rayon fibers in the second web were closely intermingled mutually across the

layer interface, and the constituent fibers in each of the first and the second webs were also closely intermingled with each other.

The resulting fleece was put into boiling water to cause the conjugate fiber to shrink and then dried in a drier at 100°C to obtain a crepe-like nonwoven fabric having a basis weight of 50 g/cm<sup>2</sup>. The resulting crepe-like nonwoven fabric had a large number of ribs randomly formed on one side thereof. The ribs were higher than those of Example 1. It had an MD strength of 3.5 kg/5 cm-width, a TD strength of 15 kg/5 cm-width, an MD elongation of 105%, and a TD elongation of 58%. It was satisfactory in hand in terms of flexibility and feel.

### EXAMPLE 3

Thermally shrinkable acrylic fiber having a fiber length of 38 mm and a fineness of 1.5 denier was carded into an intermediate web having a basis weight of 20 g/m<sup>2</sup>. Separately, non-shrinkable rayon fiber having a fiber length of 64 mm and a fineness of 1.5 denier was carded to prepare two webs each having a basis weight of 20 g/m<sup>2</sup>. The intermediate web was sandwiched in between the two webs to prepare a three-layered laminate. The laminate was placed on a flat plate and treated with water jets in the same manner as in Example 1 to obtain fleece, in which the acrylic fibers of the intermediate web and the rayon fibers of the upper and the lower webs were closely intermingled mutually across the layer interfaces, and the



constituent fibers in each of the three webs were also closely intermingled with each other.

The resulting fleece was led into hot air at 150°C to cause the acrylic fibers to shrink to obtain a crepe-like nonwoven fabric having a basis weight of 60 g/cm<sup>2</sup>. The resulting crepe-like nonwoven fabric had a large number of ribs randomly formed on both sides thereof. The ribs were equal in height to those of Example 2. It had an MD strength of 5.5 kg/5 cm-width, a TD strength of 16.5 kg/5 cm-width, an MD elongation of 115%, and a TD elongation of 65%. It was satisfactory in hand in terms of flexibility and feel.

[Effect of the Invention]

Since the crepe-like nonwoven fabric of the invention contains no binder to bind the constituent fibers but has the constituent fibers closely intermingled by a high-pressure columnar flow of fluid, it exhibits not only flexibility but sufficient strength for ensuring excellent form stability. Because the numerous ribs randomly formed on its surface are made mainly of non-shrinkable fiber, the nonwoven fabric has excellent hand with good feel to the touch.

Accordingly, the crepe-like nonwoven fabric of the invention is useful for various applications in which conventional nonwoven fabrics are unsuitable, such as towels and underwear, and is of great benefit to industry.

## ⑫ 公開特許公報(A)

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⑮ 発明の名称 形態安定性に優れたしば調不織布

⑯ 特 願 昭62-140531

⑰ 出 願 昭62(1987)6月4日

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## 要 約

## 1. 発明の名称

形態安定性に優れたしば調不織布

## 2. 特許請求の範囲

感熱収縮性繊維5～90重量%と非収縮性繊維10～95重量%とよりなる結合剤を含有しない不織布であって、前記不織布は前記感熱収縮性繊維と前記非収縮性繊維とが高压柱状流によって相互に緊密に結合せしめられると共に前記感熱収縮性繊維の収縮発現により前記非収縮性繊維に挽みが生じて前記不織布表面に無作為な多数の皺が形成されてなることを特徴とする形態安定性に優れたしば調不織布。

## 3. 発明の詳細な説明

## (イ) 産業上の利用分野

本発明は、結合剤を含有せず且つ形態安定性及び風合に優れたしば調不織布に関し、特にタオルや肌着等の用途に適したしば調不織布に関するものである。

## (ロ) 従来の技術及び発明が解決しようとする問

## 題点

不織布は、織物や編物と異なり、繊維を紡績及び編織することなく得られるものであるため、安価に製造でき各種の用途に用いられている。しかし、織物等に比べて風合の点で劣るため、衣料品や布製日用品としての用途に適するものではなかった。

そこで、従来より不織布の表面に多数の皺を形成させ、しば調不織布とし風合の改善を図っている。このしば調不織布の製造方法は以下のとおりである。まず、潜在感熱収縮性繊維と非収縮性繊維とを混合してウェブを作成し、このウェブに結合剤溶液を付与する。次いで、結合剤溶液を半乾燥状態としてウェブ中の構成繊維を仮接着せしめた後、潜在感熱収縮性繊維を収縮させ非収縮性繊維を挽ませて、ウェブ表面に多数の皺を形成させる。その後、結合剤溶液を完全に乾燥させてしば調不織布を得るというものである。

しかしながら、この結合剤を含有したしば調不織布は全体に結合剤が固着しているため、柔軟性

及び手触りの点で硬さが強っており、十分な風合の改善は行われていない。また、構成繊維間が結合剤による結合であるため不織布の強度が低い。従って、このような不織布は簡易手拭き等の限られた用途に用いられるのみで、衣料品やタオル等の布製身用品として用いることはできなかった。

そこで、本発明者はこの点を改良すべく鋭意検討した結果、結合剤を用いずに強度の高いしば調不織布を得ることに成功し、本発明に至ったものである。

#### (ハ) 問題点を解決するための手段及び作用

即ち本発明は、感熱収縮性繊維5～90重量%と非収縮性繊維10～95重量%とよりなる結合剤を含有しない不織布であって、前記不織布は前記感熱収縮性繊維と前記非収縮性繊維とが高压柱状流によって相互に緊密に絡合せしめられると共に前記感熱収縮性繊維の収縮発現により前記非収縮性繊維に挽みが生じて前記不織布表面に無作為な多数の畝が形成されてなることを特徴とする形態安定性に優れたしば調不織布に関するものである。

と非収縮性繊維の量が相対的に少なくなり、非収縮性繊維の挽み量が少なくなって、製造上不織布の表面に畝を形成し難くなるので好ましくない。

感熱収縮性繊維と非収縮性繊維とは高压柱状流によって相互に緊密に絡合せしめられている。高压柱状流とは、微細な直径のノズル孔を通して高压で非圧縮性の流体を噴出させて得られるものである。具体的には、ノズル孔径0.001～0.1mm程度のノズルを用いて圧力5～400kg/cm<sup>2</sup>で水を噴出させて得られるものである。このような高压柱状流を繊維ウェブに作用させると、構成繊維が運動し、隣接する他の構成繊維を相互に緊密に絡合する。その結果、結合剤を付与しなくとも強度の高い不織布を得ることができるのである。

本発明に係るしば調不織布の表面には無作為な多数の畝が形成されている。この畝は非収縮性繊維が挽んだ結果、形成されるものである。非収縮性繊維の挽みは、感熱収縮性繊維と非収縮性繊維とからなる繊維ウェブに高压柱状流を作用させて両繊維を緊密に絡合させた後、感熱収縮性繊維を

本発明で用いる感熱収縮性繊維とは、熱を与えることにより収縮（本発明においては捲縮を含む）を発現する繊維である。このような潜在的に収縮性を有する繊維は、例えば、紡糸中に高度な延伸を施すことによって作成することができる。また、収縮率の異なる二成分を別個のノズル孔より溶融紡糸すると共に貼り合わせた複合繊維（サイドバイサイド型複合繊維）であってもよい。この複合繊維は、熱を与えることにより一方の成分のみが収縮を起こすため、捲縮を発現する繊維である。

本発明で用いる非収縮性繊維とは、前記の感熱収縮性繊維が収縮を発現する温度では収縮を起こさない繊維のことである。

本発明に係るしば調不織布は、感熱収縮性繊維5～90重量%と非収縮性繊維10～95重量%とよりなる。感熱収縮性繊維が5重量%未満であると、総和的な収縮発現が少なくなり、非収縮性繊維を十分挽ませることが製造上できないので好ましくない。また、感熱収縮性繊維が90重量%を超える

収縮させることにより生じる。即ち、感熱収縮性繊維と絡合している非収縮性繊維の任意の二点間の距離が、感熱収縮性繊維の収縮の発現により縮まることにより、非収縮性繊維の未絡合部が挽むのである。

本発明に係るしば調不織布は、以下の如き製造方法で得ることができる。まず、潜在感熱収縮性繊維と非収縮性繊維との混合綿をカード法やエアレイ法等によって、シート状として繊維ウェブを作成する。その後、この繊維ウェブ全体に高压柱状流を作用させて、構成繊維間が緊密に絡合した繊維フリースを得る。この繊維フリース中の潜在感熱収縮性繊維に熱を与えて収縮を発現させることにより、本発明に係るしば調不織布を得ることができる。

#### (ニ) 実施例

##### 実施例1

繊維長64mm、繊維径3デニールで潜在感熱収縮性のポリエステル繊維30重量%と繊維長64mm、繊維径1.5デニールで非収縮性のレーヨン繊維70重

量%とを混合して、カード法にて目付50g/m<sup>2</sup>の繊維ウェブを得た。

この繊維ウェブを平板上に設置し、ノズル径0.02cmのノズルを用いて圧力50kg/cm<sup>2</sup>で水を繊維ウェブ上に均一に噴出させた。尚、ノズル先端と繊維ウェブの距離は10cmとした。このようにして得られた繊維フリースは構成繊維相互間が緊密に絡合したものであった。

この繊維フリース全体に90℃の水蒸気を付与し、繊維フリース中のポリエステル繊維を収縮させた。その後、100℃の乾燥機中に導入して乾燥させ、目付50g/m<sup>2</sup>のしば調不織布を得た。

このしば調不織布は、不織布の両表面に多数の無作為に形成された畝を有していた。そして、このしば調不織布の物性は、経強度5.4kg/5cm巾、緯強度15kg/5cm巾、経伸度96%、緯伸度48%であり、且つ柔軟性が良好で手触りもよく風合の良好なものであった。

#### 実施例2

ナイロン6とナイロン66とよりなる二成分系の

そして、このしば調不織布の物性は、経強度3.5kg/5cm巾、緯強度15kg/5cm巾、経伸度105%、緯伸度58%であり、且つ柔軟性が良好で手触りもよく風合の良好なものであった。

#### 実施例3

繊維長38mm、繊維径1.5デニールで潜在熱収縮性のアクリル繊維100重量%を用いカード法にて、目付20g/m<sup>2</sup>の中間繊維ウェブを作成した。また、繊維長64mm、繊維径1.5デニールで非収縮性のレーヨン繊維100重量%を用いカード法にて、目付20g/m<sup>2</sup>の二枚の繊維ウェブを作成した。この二枚の繊維ウェブで中間繊維ウェブを挟んで、三層構造の繊維ウェブを作成した。この三層構造の繊維ウェブを平板上に設置し、実施例1と同様の方法にて繊維フリースを作成した。この結果、中間繊維ウェブ中のアクリル繊維は表裏面の繊維ウェブ中のレーヨン繊維と層の境界で相互に緊密に絡合すると共に各層中でも各構成繊維が相互に緊密に絡合した繊維フリースが得られた。

この繊維フリースを150℃の熱風中に導入し、

潜在熱収縮性サイドバイサイド型複合繊維であって、繊維長72mm、繊維径1.6デニールの複合繊維100重量%を用いてカード法にて目付25g/m<sup>2</sup>の第一繊維ウェブを得た。また、繊維長64mm、繊維径1.5デニールのレーヨン繊維100重量%を用いてカード法にて目付25g/m<sup>2</sup>の第二繊維ウェブを得た。この第一繊維ウェブと第二繊維ウェブとを積層した繊維ウェブを平板上に設置し、実施例1と同様の方法にて繊維フリースを作成した。この結果、第一繊維ウェブ中の複合繊維と第二繊維ウェブ中のレーヨン繊維とは層の境界で相互に緊密に絡合すると共に各層中でも各構成繊維が相互に緊密に絡合した繊維フリースが得られた。

この繊維フリースを沸騰水の中に導入し、繊維フリース中の複合繊維を捲縮させた。その後、100℃の乾燥機にて乾燥させ、目付50g/m<sup>2</sup>のしば調不織布を得た。

このしば調不織布は、不織布の一方の表面にのみ多数の無作為に形成された畝を有しており、この畝の高さは実施例1のものに比べて高かった。

繊維フリース中のアクリル繊維を捲縮させ、目付60g/m<sup>2</sup>のしば調不織布を得た。

このしば調不織布は、不織布の両表面に多数の無作為に形成された畝を有しており、この畝の高さは実施例2のものと同等であった。そして、このしば調不織布の物性は、経強度5.5kg/5cm巾、緯強度16.5kg/5cm巾、経伸度115%、緯伸度65%であり、且つ柔軟性が良好で手触りもよく風合の良好なものであった。

#### (ホ) 発明の効果

以上説明したように、本発明に係るしば調不織布は構成繊維相互間が結合剤によって結合されておらず、高圧柱状流によって緊密に絡合されているため、柔軟性に優れると共に強度が高いため極めて形態安定性に優れている。そして、更に表面には無作為な多数の畝が主として非収縮性繊維によって形成されているので、手触りがよく風合に優れている。

従って、本発明に係るしば調不織布は従来の不織布では用いられなかった各種の用途、例えばク

オル、肌等々に用いることができ、産業上極めて有益なものである。

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